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E – Trading Quantitative Analysis

Bank of America Merrill Lynch London

Worcester Polytechnic Institute

By:

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Friday, December 16th, 2011

E-TRADING QUANTITATIVE ANALYSIS

A Major Qualifying Project
Submitted to the faculty of
Worcester Polytechnic Institute
In partial fulfillment of the requirements for the
Degree of Bachelor of Science

Sponsoring Agency: Bank of America Merrill Lynch

Submitted by:

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December 16, 2011

Report Submitted to:

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ABSTRACT

Bank of America Merrill Lynch (BAML) currently keeps all data on trades, i.e. all credit and cash products and electronic inquiries in a number of databases globally, which can be a very useful decision making tool if used correctly. The Europe, Middle East & Africa (EMEA) Global Credit Trading Desk presently generates numerous reports in varying stages of completion currently distributed to both traders and managers, and is run on an ad hoc basis. However, neither managers nor traders are effectively utilizing them. Thus, the goal of our project was to analyze e-trading data collected to assist in future trading decisions and management reporting for the benefit of the traders on the BAML trading desk. Then we used such analysis to produce reports that can stand alone as a standard and be leveraged for all future analysis.

EXECUTIVE SUMMARY

Bank of America Merrill Lynch stores all data on trades and potential trades from the credit and equity markets (thousands of data points each day, the result of conducting normal business as a market maker) in numerous databases worldwide. This data can be very useful to a trader when making decisions on pricing and risk taking if used correctly, which is not necessarily the case today. There are many reports in varying stages of completion currently distributed to both traders and managers, and run on an ad hoc basis by, The Desk. This is the trading desk where traders receive inquiries which can either be the buying or selling of a cash or credit product.

Thus the goal of this project was to analyse aggregated quantitative data procured over the course of trading electronically (“Inquiry”) to assist in future trading decisions and management reporting for the benefit of the traders on BAML trading desk (“The Desk”). The aim of this was to use this data to produce reference analytics/reports that can stand alone as a standard and be leveraged for all future analysis.

In order to accomplish our goal, we analysed raw inquiry data so as to ascertain how these reports were being used and how could they be used. Furthermore, we developed a new performance metric called the Hit Rate Index and wrote SQL code that could be augmented so that this metric could be embedded into present reports. Finally after interviewing some junior traders and reviewing the content of the reports we looked at ways to improve their attractiveness and usefulness.

Based on our evaluation we provided the Global Credit Products EMEA Credit Desk with suggestions and recommendations on how to further improve their reports and make them

more useful for summary, trend and performance reporting to managers and traders. With these improvements, it stands to reason that these reports can give added insight to the trading desk. They could be used as performance measures as well as in anticipation of business, which could lead to more profitable decision making. For example, managers can readily see more accurate Hit Rates for priority clients and make adjustments where possible. For traders, they create these markets and are charged with making the business money. Therefore if they can use these reports to anticipate what their individual markets are doing then they can attack trades with more knowledge.

At the completion of our project at Bank of America Merrill Lynch we made three recommendations. The first recommendation was to change the organization of the reports, specifically organize by business sector or pod. Since the current reports contain a breakdown by trader, it would be beneficial for report recipients to see a breakdown by pod as well, since some of them are in the same pod and trade the same products.

Our next recommendation was to introduce a graphical tool that can produce visuals. Some of the reports generated by the reporting application ConnectX, come as an Excel attachment that the bank employees need to open and do further analysis on their own to gain any added value. Consequently, introducing graphs and charts that summarize the information in the attached file would provide an insight to data and be less time-consuming for report users such as traders. The limitation is that ConnectX uses SQL as a programming language and does not have an ability to build graphs and charts. There are a few solutions to this: to program ConnectX in Python or Quartz, or collect the data from the SQL database, import it into Microsoft Excel and then use Excel macros to create the graphs manually, however that later option would take more time.

Finally, our last recommendation was looking into the future. If the business is moving towards a centralized database and reporting system, either augment ConnectX to carry out our previous recommendations and roll this new and improved application to the various desks globally, or leverage what works about ConnectX and implement it into a new system.

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TABLE OF CONTENTS

Abstract	i
Executive Summary	ii
Acknowledgments.....	v
1. Introduction	5
2. Background.....	7
2.1. History of Bank of America	7
2.2. Credit Products: Credit Default Swaps & Corporate Bonds	9
2.3. Global Technology & Operations	12
2.3.1. Global Credit Products at Bank of America	12
2.3.2. Current Situation of the EMEA Credit Team	13
3. Methodology.....	15
3.1. Develop new metrics and embed them into reports	16
3.2. Analyse Aggregated Quantitative Inquiry Data	17
3.3. Improve Reports and Make Them More Attractive to Recipients	17
3.4. Summary	18
4. Results And Analysis.....	19
4.1. Development of New Metrics and Embedding Them into Reports	19
4.2. Analysis of Aggregated Quantitative Data	23

4.3.	Analysis of How to Improve Reports and Make Them More Attractive to Recipients	29
4.3.1	Credit Client Tiering Outstanding Firm/Non-Firm Requests	29
4.3.2	TradeWeb Benchmark Prices COB	30
4.3.3	CDS TWQ BMLE (EMEA) - All Transactions (Production)	31
4.3.4	CDS TWQ BMLE (EMEA) - Done Trades (Production)	35
4.3.5	iTrader Client Originated Inquiries	38
4.3.6	eCommerce Statistics - EMEA Flow Credit Priority Clients	41
5.	Conclusions	45
6.	Recommendations	47
	Bibliography	49
	Appendix A: Literature Review	51
	Appendix B: Interview Questions for Junior Traders	55
	Appendix C: Glossary of Terms for the Credit & Cash Databases Used by the EMEA Credit Desk	56

LIST OF FIGURES

Figure 1: The GANNT chart for the duration of the project.....	16
Figure 2: The formula for calculating the Hit Rate Index	22
Figure 3: Buy Trend for the month of October (breakdown by Pod)	24
Figure 4: Sell Trend for the month of October (breakdown by Pod).....	25
Figure 5: Buy Percentage for one week of October (breakdown by Pod)	27
Figure 6: Buy Percentage for one week of November (breakdown by Counterparty)	28
Figure 7: Daily trend for each trader – Confidential Bank of America Information has been removed.....	33
Figure 8: Daily trend for each SUBgroup – Confidential Bank of America Information has been removed.....	34
Figure 9: Trades done with the respective reference companies	37
Figure 10: Time vs. Trader Buy/Sell	38
Figure 11: Monthly Totals (Tickets Count) – Confidential Bank of America information has been removed.....	39
Figure 12: Monthly Totals (Volume Nominal USD) – Confidential Bank of America information has been removed.....	40

LIST OF TABLES

Table 1: The calculation of the Hit Rate Index for 25/10/2011	20
Table 2: The calculation of the Expected Hit Rates	21
Table 3: Percentages of the Grand Total.....	22
Table 4: Reviewed Report – Confidential Bank of America Information has been removed	30
Table 5: Reviewed Report – Confidential Bank of America Information has been removed	30
Table 6: Hourly Nominal USD for each trader – Confidential Bank of America Information has been removed	32
Table 7: Hourly Nominal USD breakdown by SUBgroup – Confidential Bank of America Information has been removed.....	33
Table 8: The volume of the inquiries that are done vs. other trade statues – Confidential Bank of America Information has been removed	35
Table 9: Trades done with the respective reference companies – Confidential Bank of America Information has been removed.....	36
Table 10: Time vs. Trader Buy/Sell – Confidential Bank of America Information has been removed.....	37
Table 11: Monthly Totals (Tickets Count)	39
Table 12: Monthly Totals (Volume Nominal USD)	40
Table 13: Reviewed Report – Confidential Bank of America information has been removed	41
Table 14: Reviewed Report – Confidential Bank of America information has been removed	42
Table 15: Reviewed Report – Confidential Bank of America information has been removed	43
Table 16: SQL output for the breakdown by pod	44

1. INTRODUCTION

Bank of America Merrill Lynch (BAML) stores all data on trades and potential trades from the credit and equity markets (thousands of data points each day, the result of conducting normal business as a market maker) in a number of databases globally. This data can be very useful to a trader when making decisions on pricing and risk taking when used correctly, which is not necessarily the case today. There are numerous reports in varying stages of completion currently distributed to both traders and managers, and run on an ad hoc basis by, The Desk. We will repeatedly refer to this Desk throughout the paper and it should be noted that this is the trading desk where traders receive inquiries and orders which can either be the buying or selling of a cash or credit product.

The objective of this project was to analyse aggregated quantitative data procured over the course of trading electronically (“Inquiry”) to assist in future trading decisions and management reporting for the benefit of the traders on our trading desk (“The Desk”). Thus, we will use this data to produce a number of reference analytics/reports that can stand alone as a standard and be leveraged for all future analysis.

To support this goal we would like to embed this Inquiry data into the normal decision tree when considering a trade where appropriate. The Inquiry gives the trader a picture of what a particular client is interested in trading, what a particular subset of clients is interested in trading and in some cases what the entire market wants to trade. While we do not understand these relationships today, we hope to start building connections by augmenting the Inquiry data with descriptive statistics with the aim of inferring causation where possible.

Since BAML already has a database in place, the focus of this project was to extract and analyse the data currently available in order to determine any deficiencies in the data and drawing conclusions from the data to be vetted by The Desk.

2. BACKGROUND

Electronic trading also known as e-trading, is a method of trading securities such as stocks and bonds amongst other financial derivatives and foreign exchange, electronically. Buyers and sellers are brought together using various trading platforms to create a virtual market place. This method of trading is making strides and is expanding over voice and floor trading which are historically the most common types of trading these markets are accustomed to. However, in today's world, more and more of the market gravitates to doing things electronically. Therefore financial institutions such as Bank of America Merrill Lynch (BAML) and their various competitors are seeking to improve their methods of trading as well as analyzing how successful their business currently is and where can they build on in this new avenue. This chapter will give a brief history of BAML, the various tools they have to facilitate e-trading, the current systems in place for data analysis across the business and the gaps in the existing methods of analysis and reporting for the EMEA (Europe, Middle East and Africa) division of BAML.

2.1. HISTORY OF BANK OF AMERICA

Bank of America Corporation is a banking and financial services corporation formed through NationsBank's acquisition of BankAmerica in 1998 (Encyclopædia Britannica, 2011). This corporation is one of the largest banking organizations in the United States, with their headquarters in Charlotte, North Carolina.

The bank's history dates to 1904 when Amadeo Peter Giannini opened the Bank of Italy in San Francisco. It eventually developed into Bank of America and was for a time owned by Giannini's holding company, Transamerica Corporation. It issued the first bank credit card,

BankAmericard, in 1958. (The first universal credit card, which could be used at a variety of establishments, had been introduced by the Diners' Club, Inc., in 1950.)

In 1968, the newly named BankAmerica Corporation was organized in Delaware as a holding company for Bank of America NT & SA and other financial subsidiaries. One of BankAmerica's most significant acquisitions was the 1983 purchase of Washington state bank Seafirst Corporation, which was the biggest U.S. interstate bank merger to date. After purchasing its major competitor in California, Security Pacific Corporation, in 1991, Bank of America became the first bank to offer coast-to-coast operations in the United States. It expanded into New England with the acquisition of FleetBoston Financial Corporation in 2004, and by the early 21st century, it was operating more than 5,500 bank branches in more than 20 U.S. states and conducting corporate and investment banking in numerous countries worldwide. The firm enlarged its credit-card business by acquiring National Processing, a transaction-processing firm, in 2004, while its merger with MBNA Corporation in 2006 made Bank of America a leading issuer of credit cards.

To gain a strong position in the wealth-management business, Bank of America planned in 2007 to acquire U.S. Trust Corporation, an investment firm that manages investments for high-net-worth individuals. In September 2008, Bank of America Corporation announced its plans to acquire Merrill Lynch & Co., Inc., pending the approval of both companies' regulators and shareholders. In January 2009, Bank of America announced that it would receive \$20 billion in U.S. government aid and an additional \$118 billion in guarantees against bad assets incurred because of the acquisition of Merrill Lynch. In exchange for the emergency funding, the U.S. Department of the Treasury would acquire shares in the bank.

Presently Bank of America Corporation is a world leading financial institution and is a component of the Dow Jones Industrial Average (Bank of America, 2011). They have a wide range of products and services ranging from banking, investing, to various other financial and risk management services. They also serve individual customers as well as small to middle market businesses and large corporations in over 150 countries.

2.2. CREDIT PRODUCTS: CREDIT DEFAULT SWAPS & CORPORATE BONDS

The United States has traditionally dominated the world's bond markets. Such bonds issued in the US now account for less than half –about 44%--of the global bond market volume (Association for Financial Markets in Europe (AFME), 2012). Interestingly in the US, the bond market is about the same size as the stock market. However in Europe, bonds account for about 2/3 of the total amount of securities outstanding in bonds and shares. About 60% of the European bond market is government bond debt, 29% is corporate, and 11% is asset-backed; in the US, the proportion of bonds issued by the corporate sector is said to be much larger.

Corporate Bonds are capital market instruments and in general are bonds issued by a corporation; carries no claim to ownership and pays no dividends but payments to bondholders have priority over payments to stockholders (Corporate Finance Group, 2005). Some corporate bonds called convertible bonds have the additional feature of allowing the holder to convert them to a specified number of shares of stock at any time up to the maturity date. Such products offer investors a measure of safety, as corporate bonds are evaluated and assigned a rating based on credit history and ability to repay obligations (The Securities Industry and Financial Markets Association, 2010). The higher the rating, the safer the investment as measured by the odds of

repayment of principal and interest. However, based on discussions with our sponsor it should be noted that BAML does not trade convertible bonds.

The corporate bond market sector is one of the largest in the United States and ranked third after the sovereign government bond sector and mortgage bond, which accounts for 28% and 26% of the market respectively. According to the Securities Industry and Financial Markets Association (SIFMA), as of Q2 2011, the U. S. corporate bond market size was about 7.7 trillion dollars which accounts for about 24% of the market (Securities Industry and Financial Markets Association, 2012). Looking at the global market, approximately 30% of outstanding bonds are corporate bonds. The corporate bond market in Europe continues to grow and develop however, recent market instability has caused a slowdown.

In the European corporate bond market, individual investors are less involved directly in the corporate bond market unlike in the US. According to the Association of Financial Markets in Europe (AFME), most corporate bonds trade in the over-the-counter (OTC) market, however this market does not exist in a central location (AFME, 2011). It is made up of bond dealers and brokers from both local and global markets who trade debt securities over the phone or electronically. These investors make use of electronic transaction systems to bolster the trade execution process. Like government bonds, some bonds are traded on exchanges, but the bond trading volume on the exchanges is small. The OTC market is much larger than the exchange markets, and the vast majority of bond transactions, even those involving exchange-listed issues, take place in this market.

The key players in the corporate bond market can be categorized into the following groups: issuers, underwriters, and purchasers (EconomyWatch, 2010). The issuers consist of institutions and entities that sell bonds to raise funds to finance their operations. These could

include banks, both local and multinational, as well as the government as an issuing entity. Underwriters are comprised mainly of investment banks and other leaders in the field of investment and they help issuers to raise funds through the selling of bonds. In effect, they are the intermediaries of the industry. The purchasers are simply the ones that purchase the debt instruments and could range from corporations to individual investors who invest in the bond market through various avenues.

Credit default swaps or CDS are traded derivatives on which the seller is required to make a payment to the holder of the CDS if there is a credit event for that instrument such as a bankruptcy or downgrading of the firms credit rating (Mishkin, Frederic S, 2010). Wall Street invented them in the late 1990s as a form of insurance (Norris, 2011). The original purpose of swaps was to make it easier for banks to issue complex debt securities by reducing the risk to purchasers. Between 2000 and 2008, the market for such swaps ballooned from \$900 billion to more than \$30 trillion. In sharp contrast to traditional insurance, swaps are unregulated. They played a pivotal role in the global financial meltdown in late 2008.

More recently, swaps have emerged as one of the most powerful and mysterious forces in the crisis shaking Greece and other members of the euro zone (Norris, 2011). Furthermore, they have become the subject of antitrust investigations in both the United States and the European Union. The investigations focused on whether the handful of big banks that dominate the swaps field have harmed rival organizations that could compete in markets for providing information and clearing swaps deals. For more information on Credit Default Swaps and Corporate Bonds, please refer to Appendix A.

2.3. GLOBAL TECHNOLOGY & OPERATIONS

The Global Technology & Operations (GT&O) division of BAML is an organization of more than 74,000 associates worldwide (Bank of American, 2011a). GT&O includes technology and operations supporting business lines across the enterprise. Through operations in more than 40 countries, GT&O provides end-to-end technology and fulfillment to consumer households, small businesses, corporate and institutional relationships and wealth and investment management clients. In the United States, it serves approximately 58 million consumer and small business relationships with approximately 5,700 retail-banking offices and approximately 18,000 ATMs and award-winning online banking with 29 million active users.

2.3.1. GLOBAL CREDIT PRODUCTS AT BANK OF AMERICA

Credit comes under the Global Markets umbrella division of Bank of America Merrill Lynch (BAML). Global Markets and Research Technology & Operations (GMRT&O) provides end-to-end technology solutions and operations support for the Global Markets businesses including Equity, Electronic Trading, Rates & Currencies, Credit & Structured Products, Commodities, Research, Sales and Capital Markets. In addition, the group is responsible for establishing an Architecture and Strategy framework for consistency across the Global Markets platforms.

BAML is a leader in global credit markets, providing innovative financing solutions to clients all over the world. (Bank of America Corporation, 2011) Their platform helps client's access liquidity, manage risk and maximize value across the broad credit universe. There are credit teams across the world covering the different world financial markets, i.e. the Americas,

Europe, Middle East & Africa (EMEA) and Asia. These teams use BAML's credit platform to provide liquidity and make markets for a broad suite of credit products, including investment grade and high yield corporate bonds, short-term trading vehicles, credit defaults swaps and other derivative products. The team facilitates capital raising and finds investors for investment grade and non-investment grade rated borrowers of money in primary markets.

2.3.2. CURRENT SITUATION OF THE EMEA CREDIT TEAM

Presently the EMEA credit team, which is based out of the BAML London office, produces automated daily and weekly reports of aggregated trade data for specific credit products, i.e. corporate bonds and credit default swaps (CDS) using an application called ConnectX. ConnectX is a reporting tool that is used to send reports on a timely basis to managers and traders at the Credit and Rates Desk in London. The reports that are being distributed contain raw data as well as summaries of daily activities of the trading desk. For the reports that contain raw data, they show all information received by the desk regarding all transactions and done trades for a particular day, week, and year-to-date. This includes the Trade Date, Trade Time, CDS Name, Side, Quantity, Trade Status, Executing Trader, CDS Owner etc. (See Appendix C for a glossary of terms). However there are other reports that contain more specified information such as total orders and inquiries by trader for the buying or selling of bonds and CDS, performance of each trader, done trades, break down by volume and count of tickets received. A ticket is a term used by BAML to represent an inquiry and an order together.

However, there is a gap in the information that is extrapolated from these timely reports. Information such as: What types of financial products are traded on a daily basis? What is the frequency and volume of such trades? Who are making these trades? What are the market

indicators that lead to such decisions? The answering of these questions is the basic essence of this report. To carry this out we need to analyze the data from the electronic trading systems used at the Bank of America London corporate office. Therefore, we hope to use methods of data mining to determine the types of products that are being traded and the types of clients as well as the time of day that these clients are trading these products. This thus enables performance, trend and summary metric reports to be more useful to traders and managers in making business decisions.

3. METHODOLOGY

Our goal was to provide recommendations to the Bank of America Global Credit Products EMEA Credit Desk on how to make the daily and weekly reports, which are generated by the desk, using ConnectX more useful to traders, managers and other relevant personnel. This goal was pursued through an analysis of the current system to identify the gaps, as well as through data analysis to see what could be added or subtracted from the scope of the reports.

In order to accomplish our goal, we have developed, in conjunction with our sponsor, the following three objectives:

- Develop new metrics and embed them into reports
- Analyse aggregated quantitative inquiry data
- Improve reports and make them more attractive to recipients

Based on the above objectives, we developed a methodology that helped identify the current inefficiencies and shed light on possible solutions. The following sections will explain how we achieved each of our objectives. The

Figure 1 on the next page shows the detailed plan of our project.

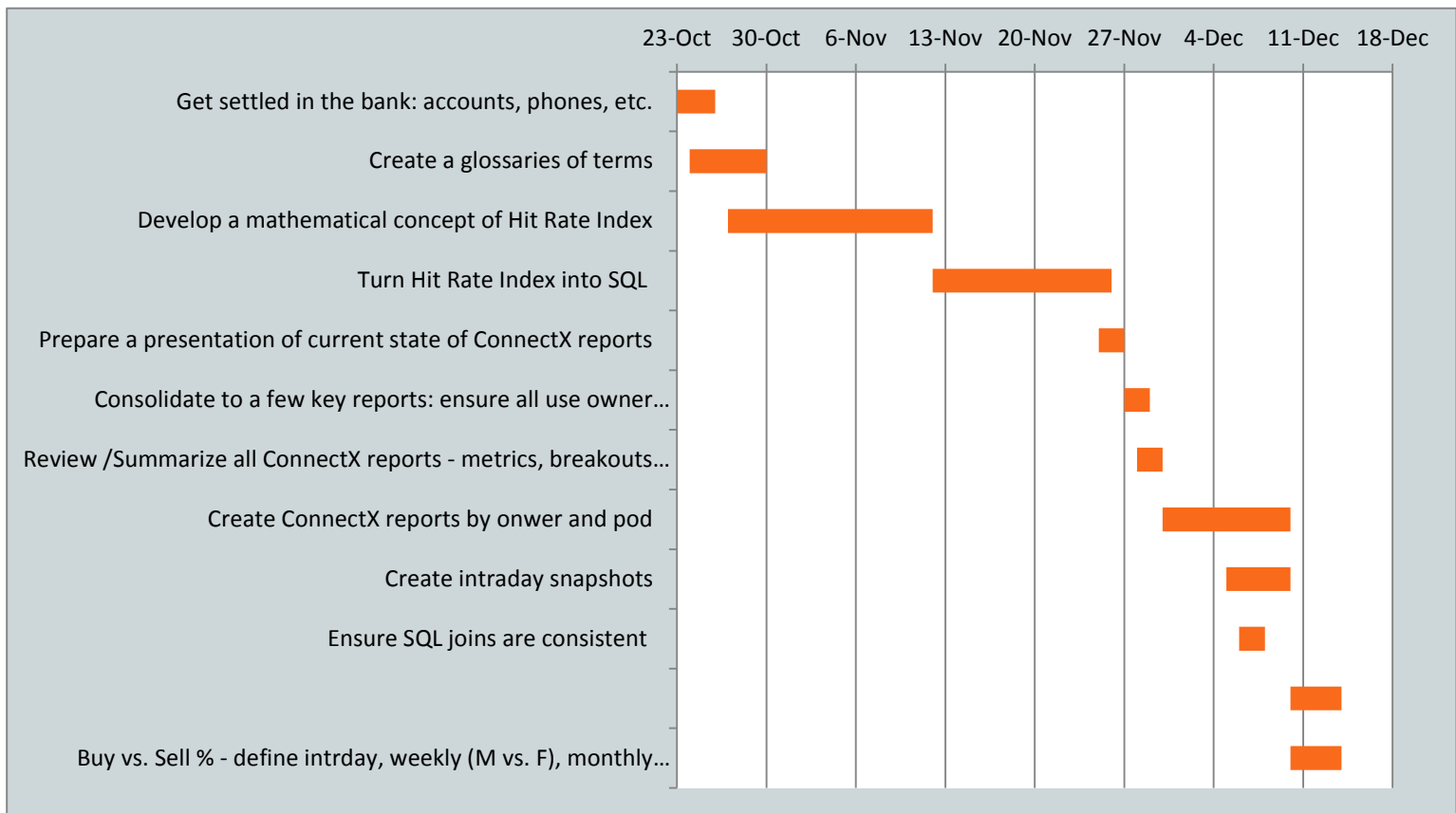


Figure 1: The GANNT chart for the duration of the project

3.1. DEVELOP NEW METRICS AND EMBED THEM INTO REPORTS

In the first phase of our project, we determined how we could enhance the way these reports can be used to determine how the business is performing at any given time. This was accomplished by looking at the Hit Rate Concept. The Hit Rate is a metric presently used to measure how the Desk is doing on an individual trader basis. The Hit Rate is calculated by dividing done trades by total trades. Specifically on orders it is done orders over total orders and for inquiries it is done inquiries over (total inquiries minus not done inquiries). This current metric is insufficient because it does not account for inquiries we do in competition, thus anything that has dealers being greater than 1. We then sought to make this better by developing

a Hit Rate Index, which mathematically shows the overall performance of the trading desk for a particular day taking into account the number of dealers in competition.

3.2. ANALYSE AGGREGATED QUANTITATIVE INQUIRY DATA

In order to understand how these reports could be used to track and showcase trends we decided to look at the raw data collected on a daily basis. Thus we imported data for a particular day, week or month from the SQL database into various excel spread sheets and then used this to produce visual snapshots which were then analysed. With this in-depth statistical and descriptive analysis we were able to determine what would be useful to be showcased to trader's automated reports that they receive. We did analysis and provided snapshots on a daily, weekly, monthly and quarterly (three month time period) in order to show how useful such information could be to traders and managers who want to predict possible future market indicators based on trends seen in the past.

3.3. IMPROVE REPORTS AND MAKE THEM MORE ATTRACTIVE TO RECIPIENTS

The last phase of our project consisted of defining an improved method for the layout of these reports that is, making them more attractive and useful to the relevant recipients. A major component of this task was identifying effective and efficient methods of presenting these reports to traders and managers. Therefore, to gain added insight into what the recipients wanted, we informally tried to set up interviews with some traders on the credit team. Through such discussions it was our aim to gauge why they do not use the reports and what changes they would be interested in seeing in the layout and presentation of them. However in the end we were only able to speak with two of them. A sample of the questions we asked can be seen in

Appendix B: Interview Questions for Junior Traders. Based on the responses of the traders we designed a new proposed layout using SQL.

3.4. SUMMARY

Determining how to make the reporting system and the reports more useful are key factors in our recommendations for an improved system. Our primary means for collecting data was through the present ConnectX reports, BAML's SQL database and the interviews with the junior traders. These methods allowed us to analyse the problem and enabled us to see where the breakdown is and how the system can be enhanced. Thus based on our evaluation, we provided the Global Credit Products EMEA Credit Desk with suggestions and recommendations on how to further improve their reports and make them more useful for summary, trend and performance reporting to managers and traders.

4. RESULTS AND ANALYSIS

4.1. DEVELOPMENT OF NEW METRICS AND EMBEDDING THEM INTO REPORTS

To understand what metrics would be useful to embed into the ConnectX reports we analysed the performance measures presently used in the system. As mentioned in the Methodology chapter, this was accomplished by looking at the Hit Rate Concept. Some of the generated reports show a calculated hit rate.

Fundamentally, this hit rate was calculated by dividing done trades by total trades. It should be noted that a trade status can be classified as either done or not done in the case of an order and done, not done, done away, none and unknown in the case of an inquiry. An order is a type of trade or ticket received from a client that goes to one trader and it means that the client is willing to buy or sell a bond. On the other hand, an inquiry is a bond in competition. It is an electronic interaction between a client and the desk. Thus it is when a client tries to trade with the desk. Therefore both orders and inquiries are types of trades that are received by traders electronically. For more detail on this please see the glossaries in **Appendix C: Glossary of Terms for the Credit & Cash Databases Used by the EMEA Credit Desk.**

The hit rate being used presently as defined on orders as done orders over total orders and for inquiries it is done inquiries over (total inquiries minus not done inquiries). This current metric was insufficient because it did not account for inquiries done in competition, thus anything that has dealers being greater than 1. Therefore we developed a new mathematical concept for measuring performance called the Hit Rate Index.

Table 1 below shows inquiry data we pulled and then pivoted from the database. In order to develop a new mathematical concept, first, we pulled data for one week of October, 2011 from the SQL server and pivoted it into 5 tables, in the format used in Table 1. When pivoting tables we selected fields that were used in a previous Hit Rate calculation, such as type of trades, either order or inquiries, action detail which depicts whether an order or a trade was done or not done, nominal USD. Then we added a new field of dealers to show how many dealers were in competition for an inquiry. An order always has only one dealer in competition. Finally, the table also displays totals for each dealer and each action detail.

Table 1: The calculation of the Hit Rate Index for 25/10/2011

TYPE	ACTION_DETAIL	TRADE_DATE	1	2	3	4	5	6	8	10	Grand Total
INQUIRY	DONE	25/10/2011	11,488,118.36	6,164,836.22	20,710,491.36	17,244,045.28	34,582,077.84	52,433,544.13			142,623,113.19
	DONE AWAY	25/10/2011		1,504,701.07	15,998,979.85	43,083,526.42	118,653,318.33	131,894,824.73	104,118.95		311,239,469.34
	N	25/10/2011		1,595,456.14	2,290,616.80	1,006,483.14	11,415,791.80	18,493,099.60			34,801,447.48
	NONE	25/10/2011			277,650.52	138,825.26	3,678,869.41	6,934,321.77	832,951.56		11,862,618.52
	NOT DONE	25/10/2011	6,248,524.98	15,412,643.00	17,447,941.58	16,755,244.47	73,425,401.58	38,259,058.62			167,548,814.23
	UNKNOWN	25/10/2011	23,712,166.33	48,063,642.23	77,229,835.49	83,496,594.74	174,835,015.47	183,879,372.87	250,000.00	1,457,665.24	592,924,292.38
INQUIRY Total			41,448,809.67	72,741,278.65	133,955,515.60	161,724,719.32	416,590,474.43	431,894,221.71	1,187,070.51	1,457,665.24	1,260,999,755.13
ORDER	DONE	25/10/2011	26,701,503.58								26,701,503.58
	N	25/10/2011	694,126.30								694,126.30
	NOT DONE	25/10/2011	61,409,748.40								61,409,748.40
ORDER Total			88,805,378.28								88,805,378.28
Grand Total			130,254,187.96	72,741,278.65	133,955,515.60	161,724,719.32	416,590,474.43	431,894,221.71	1,187,070.51	1,457,665.24	1,349,805,133.41
Expected Hit Rates			100%	50%	33%	25%	20%	17%	13%	10%	
Hit Rate Inquiries			32.64%	10.75%	17.78%	11.89%	10.08%	13.32%	0.00%	0.00%	13.04%
Hit Rate Inquiries Indexes			32.64%	21.51%	53.33%	47.58%	50.39%	79.92%	0.00%	0.00%	
Hit Rate Orders			30.07%								30.07%
Hit Rate Orders Index			30.07%								
Inquiries			0.0307	0.0539	0.0992	0.1198	0.3086	0.3200	0.0009	0.0011	
Orders			0.0658								
% of grand total			1.0022%	1.1590%	5.2923%	5.7007%	15.5509%	25.5725%	0.0000%	0.0000%	
Hit Rate Index			56.2558%								

The process of developing the Hit Rate Index involved a number of mathematical calculations. The first step was the simple calculation of the expected Hit Rate and the formula is 1 over number of dealers. Thus we got the percentages shown in circles in Table 2 on the next page. In the example, there are 2 dealers in competition for an inquiry, thus the expected Hit Rate is 50%. It is the minimum percentage for the EMEA trading desk of getting the trade done similarly the other dealer in competition has a 50% chance to successfully get the trade. The

reason why we didn't set the expected Hit Rate as 100% for every trade, no matter how many dealers are in competition, was that it is unfair to expect a trader to get every single trade.

Table 2: The calculation of the Expected Hit Rates

TYPE	ACTION_DETAIL	TRADE_DATE	1	2
INQUIRY	DONE	25/10/2011	11,488,118.36	6,164,836.22
	DONE AWAY	25/10/2011		1,504,701.07
	N	25/10/2011		1,595,456.14
	NONE	25/10/2011		
	NOT DONE	25/10/2011	6,248,524.98	15,412,643.00
	UNKNOWN	25/10/2011	23,712,166.33	48,063,642.23
INQUIRY Total			41,448,809.67	72,741,278.65
ORDER	DONE	25/10/2011	26,701,503.58	
	N	25/10/2011	694,126.30	
	NOT DONE	25/10/2011	61,409,748.40	
ORDER Total			88,805,378.28	
Grand Total			130,254,187.96	72,741,278.65
Expected Hit Rates			100%	50%
Hit Rate Inquiries			32.64%	10.75%
Hit Rate Inquiries Indexes			32.64%	21.51%
Hit Rate Orders			30.07%	

The next step in the process was to calculate Hit Rates for orders and inquiries. In order to do that we used the formulas shown below:

Hit Rate for orders:

$$\frac{\text{Done Orders}}{\text{Total Orders}}$$

Hit Rate for Inquiries:

$$\frac{\text{Done Inquiries}}{(\text{Total Inquiries} - \text{Not Done Inquiries})}$$

Then we found Hit Rate Indexes by dividing newly calculated Hit Rates by the Expected Hit Rates for both orders and inquiries.

Subsequently we now had to find out what percentage of the grand total nominal USD was the total nominal USD for each dealer in competition. We took these totals and divided each

by the overall Grand Total. The results of that calculation were divided by the Hit Rate Indexes thus giving us the numbers in the red circle in Table 3 below.

Table 3: Percentages of the Grand Total

TYPE	ACTION_DETAIL	TRADE_DATE	1	2	3
INQUIRY	DONE	25/10/2011	11,488,118.36	6,164,836.22	20,710,491.36
	DONE AWAY	25/10/2011		1,504,701.07	15,998,979.85
	N	25/10/2011		1,595,456.14	2,290,616.80
	NONE	25/10/2011			277,660.52
	NOT DONE	25/10/2011	6,248,524.98	15,412,643.00	17,447,941.58
	UNKNOWN	25/10/2011	23,712,166.33	48,053,642.23	77,229,835.49
INQUIRY Total			41,448,809.67	72,741,278.65	133,955,515.60
ORDER	DONE	25/10/2011	26,701,503.58		
	N	25/10/2011	694,126.30		
	NOT DONE	25/10/2011	61,409,748.40		
ORDER Total			88,805,378.28		
Grand Total			130,254,187.96	72,741,278.65	133,955,515.60
Expected Hit Rates			100%	50%	33%
Hit Rate Inquiries			32.64%	10.75%	17.78%
Hit Rate Inquiries Indexes			32.64%	21.51%	53.33%
Hit Rate Orders			30.07%		
Hit Rate Orders Index			30.07%		
Inquiries			0.0307	0.0539	0.0992
Orders			0.0658		
% of grand total			1.0022%	1.1590%	5.2923%
Hit Rate Index			56.2558%		

Finally we summed all the numbers in the red circle above together and got the number highlighted in yellow in Table 3. This table represents our new mathematical concept of the Hit Rate Index, which can be calculated for each trader for a working day, month and year. The simplified formula is shown in Figure below. Due to proprietary BAML rights the Completed SQL is not showcased in this report.

% of Grand Total Orders (GTO) = (Orders Done)/(Grand Total)	
% of Grand Total Inquires (GTI) = (Inquiry Total)/(Grand Total) × (Inquiry Done)/((Inquiry Total-Inquiry Not Done)(Expected Hit Rate)) calculate for each dealer	
Sum all GTI's = $\sum GTI$	
Hit Rate Index = GTO + $\sum GTI$	

Figure 2: The formula for calculating the Hit Rate Index

This new Index takes the Expected Hit Rate, which is the inverse of the number of dealers in competition, and measures it against the weighted average of the calculated Hit Rate. As a result, the Hit Rate Index shows the overall performance of the trading desk for a particular day taking into account the number of dealers in competition. It is more beneficial than the old concept because now the report recipients can see the performance not only for a particular trader but for the whole trading desk.

4.2. ANALYSIS OF AGGREGATED QUANTITATIVE DATA

In order to understand how these reports could be used to analyse trends we imported raw data from the SQL database into various excel spread sheets and then used these to produce visual snapshots which were then evaluated. Analysis was done for different time periods, i.e. daily, weekly, monthly and quarterly by creating charts for each respective period to review which would be most beneficial. The emphasis was placed on looking at the performance of the business over time with respect to specific pods or counter parties. BAML's definition of a pod is a specific sector that the desk conducts business with, namely corporate, high yield and financial companies. Raw trade data was imported to look at both the buying and selling sides of these pods as traders in the business are creating markets for the products being bought and sold by the desk. Thus by using the information compiled, traders could more readily pick up on trends and analyse the market to see if the atmosphere of the market is tending towards specific outcomes and make adjustments if necessary.

An example of how we looked at the various time periods is seen in Figure 3 and Figure 4, which depict a snapshot of some of the graphs we created for monthly analysis. Figure 3 specifically shows the value of bonds which were bought on a daily basis in the month of

October for each specific pod. Therefore, in reading the graph the vertical axis shows the total value of the bonds in billions of United States Dollars and the horizontal depicts the specific days. The lines on the graph are relative to each pod; hence the grey line B-C illustrates bonds bought from the corporates pod, the orange line B-F shows bonds bought from financials pod and the blue line B-H shows bonds bought from companies classified as high yield. From this graph traders can easily ascertain that the value of corporate bonds that buy is greater than the amount bought for either high yield or financial bonds for the month of October.

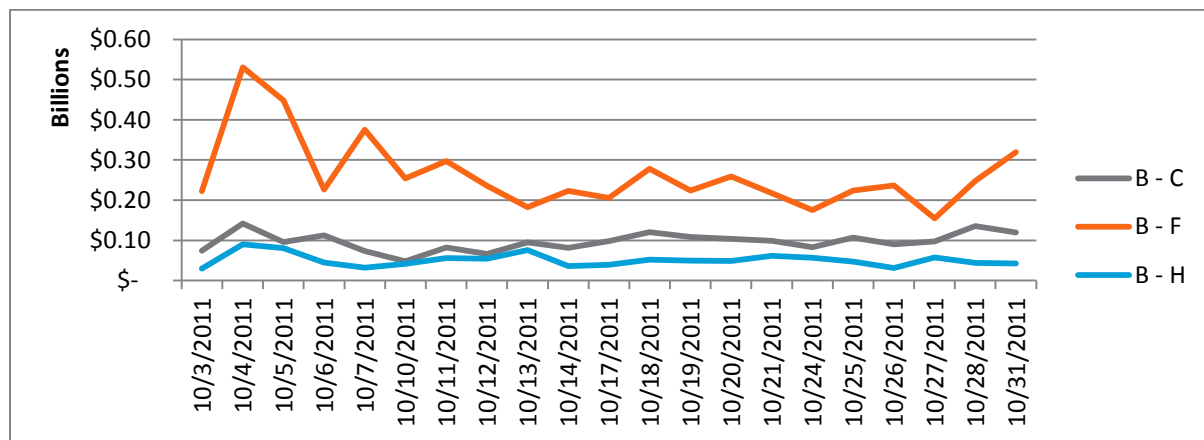


Figure 3: Buy Trend for the month of October (breakdown by Pod)

Additionally traders themselves are grouped into pods so they would keenly benefit from seeing these trends broken out in this way. For example on October 4, 2011 there was an unusual spike in the buying of financial bonds by the traders in that group, amounting to over US \$0.50 billion on that day alone. To now ascertain the possible reasons the traders could go back into their records and see what could possibly have caused this sudden spike as it dropped slightly the next day but still maintained its high status before completely falling to around the average of between US\$0.20 billion and US\$0.30 billion for the rest of the month. Such insights could give

way to either a developing trend in the market or underscore a pre-existing trend that could be used to BAML's advantage.

Figure 4 on the other hand, illustrates the value of bonds which were sold on a daily basis in the month of October for each specific pod. Therefore similar to Figure 3 the vertical axis shows the total value of the bonds in billions of United States Dollars and the horizontal depicts the specific days. The lines on the graph are relative to each pod, hence the grey line S-C illustrates bonds sold from the corporates pod, the orange line S-F shows bonds sold from financials pod and the blue line S-H shows bonds sold from companies classified as high yield. With both of these graphs, traders from each pod can see the whole picture of business activity for their given segment, thus enabling them to see if they are meeting trading goals sector of business.

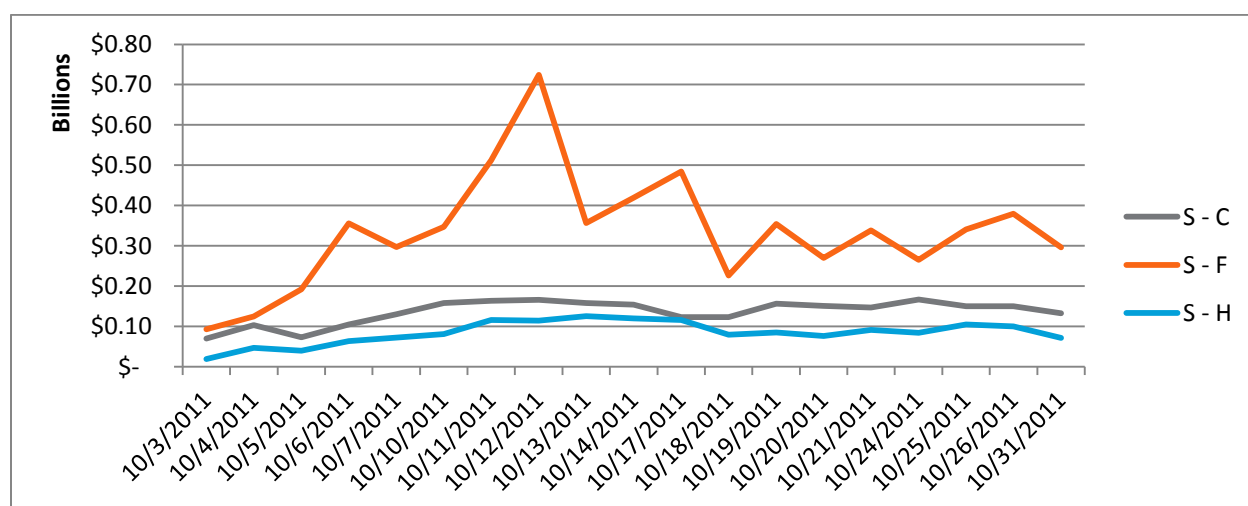


Figure 4: Sell Trend for the month of October (breakdown by Pod)

A similar analysis was conducted based on the three different counterparties. A counterparty refers to the type of business category the EMEA credit desk is catering to, specifically real

money, hedge funds and banks. In both instances we took our examination a step further by including an analysis of the buy percentage for the different pods and counterparties. Buy percentages (Buy %) would be an indicator to tell whether clients are buying or selling thus enabling traders to gauge whether our clients are bullish or bearish. Figure 5 and Figure 6 show snapshots of some of the images we created in our analysis for pods and counterparties respectively. Buy percentage is depicted on the vertical axis, and on the horizontal axis we have the days of the week further broken down by time of day. The superimposed horizontal line at 50% depicts where buy percentage and sell percentage (Sell %) are equal thus meaning that neither is doing better than the other. It should be noted that since these figures are from an internal perspective, a high buy % means that the clients are bearish and low buy % (High sell %) means that the clients are bullish.

Figure 5 shows the pod buy percentage for the week of October 3rd 2011. The graph itself illustrates cumulative of all three pods, how much is being bought and sold from a BAML perspective. Hence for Figure 5 in particular we see that the week begins with a high buy % meaning that clients were very bearish on October 3rd and 4th. However, after a few fluctuations on the 5th, by Thursday October 6 a high sell % reins indicating a more bullish shift on the part of BAML's clients. Reviewing such a graph and the indicators of such trends at the end of the week can aid traders in aligning themselves more closely with the needs of customers for the next week.

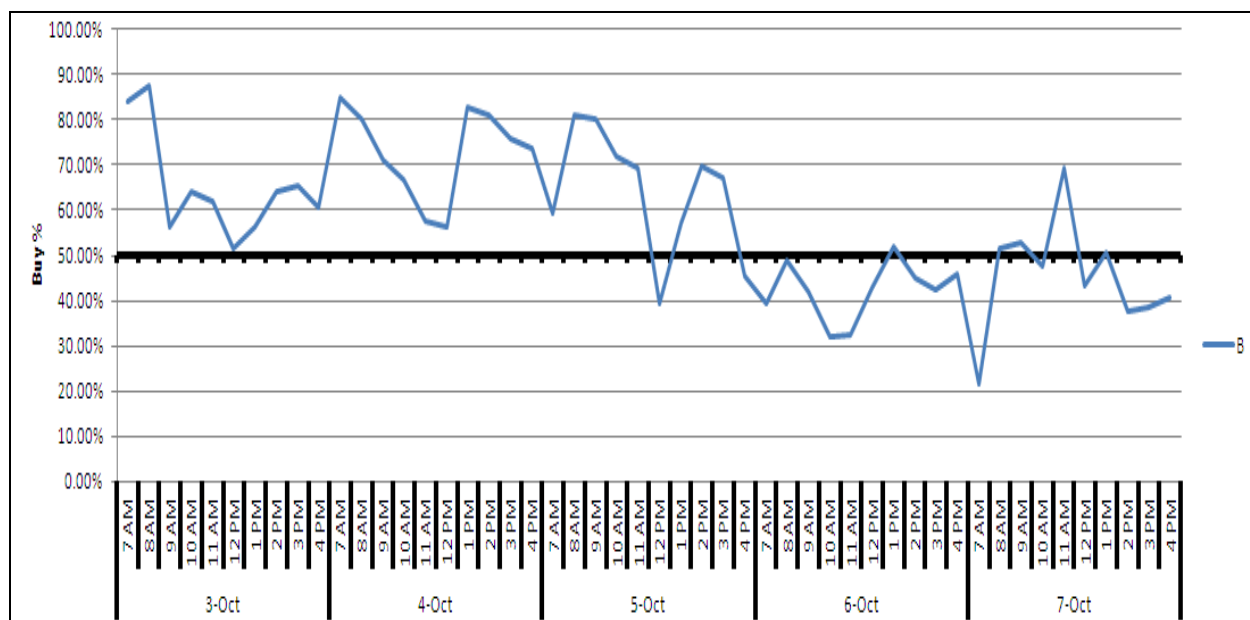


Figure 5: Buy Percentage for one week of October (breakdown by Pod)

On the other hand, Figure 6, depicted on the next page, looks at counterparties and is for the week of November 28th 2011. Similar to Figure 5 above, Figure 6 depicts the cumulative buy % for all three counterparties for a given week and it also to be viewed from an internal perspective. From this graph it is evident that for this particular week whatever mode the market is in, bullish or bearish, at the end of trading on a particular day it starts in the completely opposite direction the next day. For example, after a particularly bearish day with a high buy % on the BAML side for November 28th, the day ended with clients becoming more bullish. Nevertheless, at the opening of the market on the 29th weariness may have set in, as shown by the low buy percentage trend which broke and gave way to a high buy percentage at 8 am. Such a trend continues for the rest of the week as even when counterparties closes with a high buy % on November 30th, clients became very bullish to start off the morning of December 1. Reviewing such an illustration along with the actual raw data at the end of each week can either

highlight this as a normal trend, or underscore some incident that may have occurred that week which may have induced such actions on the part of the business and its clients.

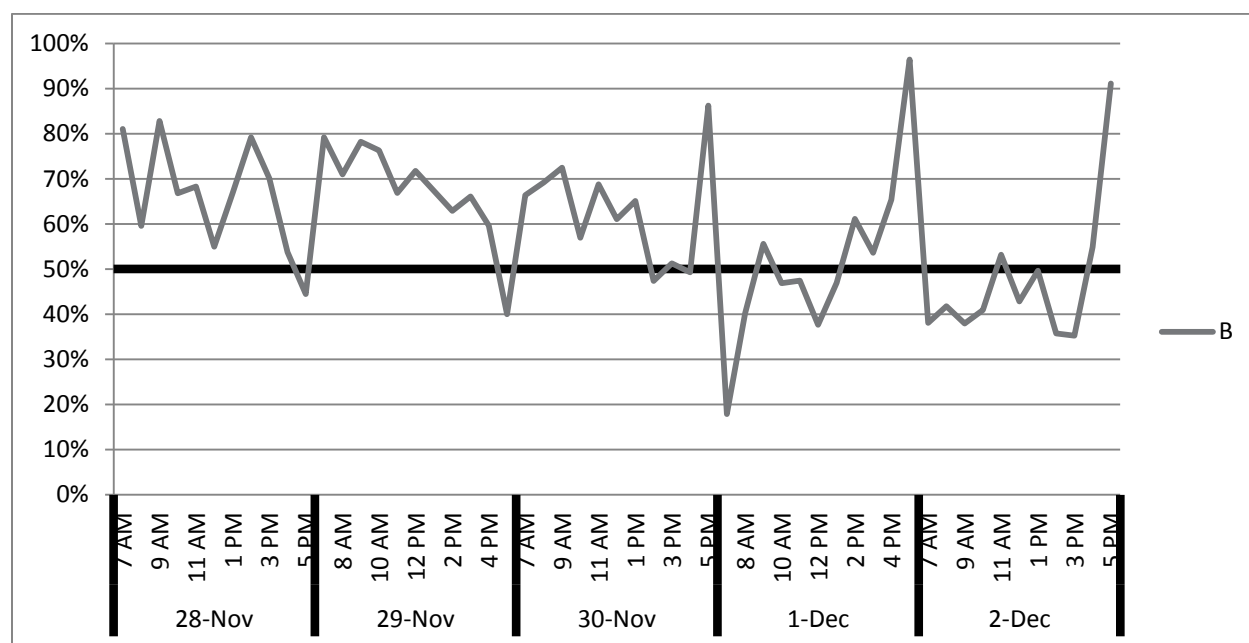


Figure 6: Buy Percentage for one week of November (breakdown by Counterparty)

With all this data, traders can be more efficient. Being in the markets on a daily basis, traders generally have a good idea as to what is going on, but such analysis can serve to further verify their impression of what is happening in the market or it can offer insight to avenues that they had not considered in the decision making process. It should be noted that as a result of the sensitive nature of the data collected, we are unable to provide a more in-depth perspective on the analysis in our report.

4.3. ANALYSIS OF HOW TO IMPROVE REPORTS AND MAKE THEM MORE ATTRACTIVE TO RECIPIENTS

The final phase was to conduct a descriptive analysis on each of the reports presently being produced. This was done to ascertain if anything needed to be changed and if deemed necessary, make suggestions on flaws and improvements where needed.

4.3.1 CREDIT CLIENT TIERING OUTSTANDING FIRM/NON-FIRM REQUESTS

Table 4 below, illustrates the inquiries that are outstanding, i.e. not completed or converted to orders based on client tiering. BAML groups their clients into tiers so that they can readily see the volume of business that is being conducted with a particular tier of client. For example, BAML would prefer to do most of its business with their gold clients as opposed to clients that they categorize as aggressive. For more information on client tiering please see **Appendix C: Glossary of Terms for the Credit & Cash Databases Used by the EMEA Credit Desk.**

At times this daily report is sent out blank and other times it is populated. Due to the proprietary nature of this data the table below was intentionally left blank and the date was removed. The fact that sometimes this report is blank at the end of the day, could indicate that either there are no inquiries outstanding for that day or the data is not being effectively captured. This could be useful on a managerial level to see how much business is being left undone with a particular tier of clients.

Client Firm/Non-Firm Outstanding End of Day Requests

IPS Symbol	Client Name	User First Name	User Last Name	Current Tier	Current Firm Price Setting	Requested Firm Price Update	BBG Login	Tier Added/Updated By

Table 4: Reviewed Report – Confidential Bank of America Information has been removed

4.3.2 *TRADEWEB BENCHMARK PRICES COB*

This daily report comes in the form of an excel file. A snapshot of it is shown below in Table 5:

Benchmark_Isin	Benchmark_Desc	BM_Bid_Price	BM_Bid_Yield	BM_Ask_Price	BM_Ask_Yield

Table 5: Reviewed Report – Confidential Bank of America Information has been removed

The report shows Close of Business Benchmark Prices for a particular day. The Benchmark_Isin and Benchmark_Desc are unique identifiers that correlate a certain products ticker, coupon and maturity. For example, to the untrained eye one would assume under Benchmark_Desc that the Date shown is the date of the maturity of the bond and the '4.25' would be the coupon price and 'DBR' would be bond ticker. Therefore since the 'BM_ISIN' and the 'BM_Desc' show the same thing in just in different formats, the report could be simplified by just using one.

The 'bid' is the highest price being offered by the buyers and the 'ask' is the lowest price the sellers will accept. The BM_Ask_Yield is the rate of return that a buyer would get if they bought the bond at the asked price. It could be beneficial to show a Bid-Ask Spread to see the size of the spread from one bond to another and then if the trader is interested they can use the BM_ISIN or BM_Desc to back trace how successful trades are given the size of the spread.

4.3.3 CDS TWQ BMLE (EMEA) - ALL TRANSACTIONS (PRODUCTION)

The CDS TWQ BMLE (EMEA) daily report comes in the form of an excel file that contains all the information regarding the CDS trades irrespective of their trade status on a given day. This file is too dense as it just regurgitates all the information regarding all CDS trades for the day and then it is up to the recipient to extrapolate the relevant information. So as not to undermine the value of the raw data, this file could still be sent out to persons who want to trace the trade actions themselves. However, there are additional ways to simplify the data so that persons who do not really need all this information are not inundated with all this data.

Upon review of the table, we have highlighted just a few ways this report could be simplified. For example, under the Trader column, this would be better received if it showed the

actual trader instead of the NBK ID. The NBK ID is akin to an employee ID number.

Additionally, the CDS Name includes the Sub GROUP name; therefore both do not necessarily need to be displayed. The columns Subordinate, Reconstruction and Series could be eliminated since they seemingly always return a value of 'NA' and 'ITRAXX' respectively.

This raw data could be made more useful to both managers and traders if it was broken into subsets. For example, a report showing a Trader Analysis, illustrated below in Table 6 and Figure 7, could be done on a daily, weekly, and monthly basis to show if there are trends based on trader and time of day. Due to the proprietary nature of this information, the specific date this data was taken from has been removed from the table and figures.

Sum of Quantity	Column Labels			
Row Labels	Employee	Employee	Employee	Grand Total
7 AM	50,000,000	50,000,000		100,000,000
8 AM	180,000,000	40,000,000		220,000,000
9 AM	375,000,000	55,000,000		430,000,000
10 AM	225,000,000			225,000,000
11 AM	130,000,000			130,000,000
12 PM	268,000,000	50,000,000		318,000,000
1 PM	255,000,000	15,000,000		270,000,000
2 PM	370,000,000		20,000,000	390,000,000
3 PM	125,000,000			125,000,000
4 PM	15,000,000			15,000,000
Grand Total	1,993,000,000	210,000,000	20,000,000	2,223,000,000

Table 6: Hourly Nominal USD for each trader – Confidential Bank of America Information has been removed

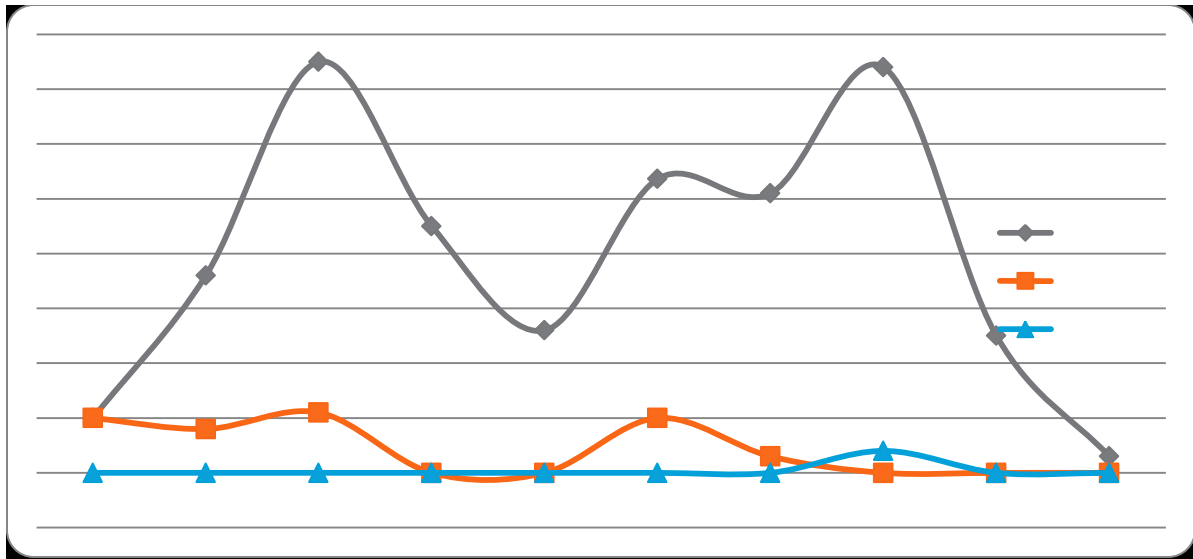


Figure 7: Daily trend for each trader – Confidential Bank of America Information has been removed

In addition, data could be grouped based on SUBGroup and time and then trends based on what SUBGroups trade the most at what times, could also be relevant to managers. This is seen in the Table 7 and Figure 8 shown below.

Sum of Quantity						
Time	Sub Group 1	Sub Group 2	Sub Group 3	Sub Group 4	Sub Group 5	Grand Total
7 AM		50,000,000			50,000,000	100,000,000
8 AM	75,000,000	40,000,000		105,000,000		220,000,000
9 AM	5,000,000	375,000,000		50,000,000		430,000,000
10 AM	50,000,000	100,000,000		75,000,000		225,000,000
11 AM		100,000,000		30,000,000		130,000,000
12 PM		300,000,000		18,000,000		318,000,000
1 PM	15,000,000	220,000,000		35,000,000		270,000,000
2 PM		350,000,000	20,000,000	20,000,000		390,000,000
3 PM	15,000,000	20,000,000		90,000,000		125,000,000
4 PM				15,000,000		15,000,000
Grand Total	160,000,000	1,555,000,000	20,000,000	438,000,000	50,000,000	2,223,000,000

Table 7: Hourly Nominal USD breakdown by SUBgroup – Confidential Bank of America Information has been removed

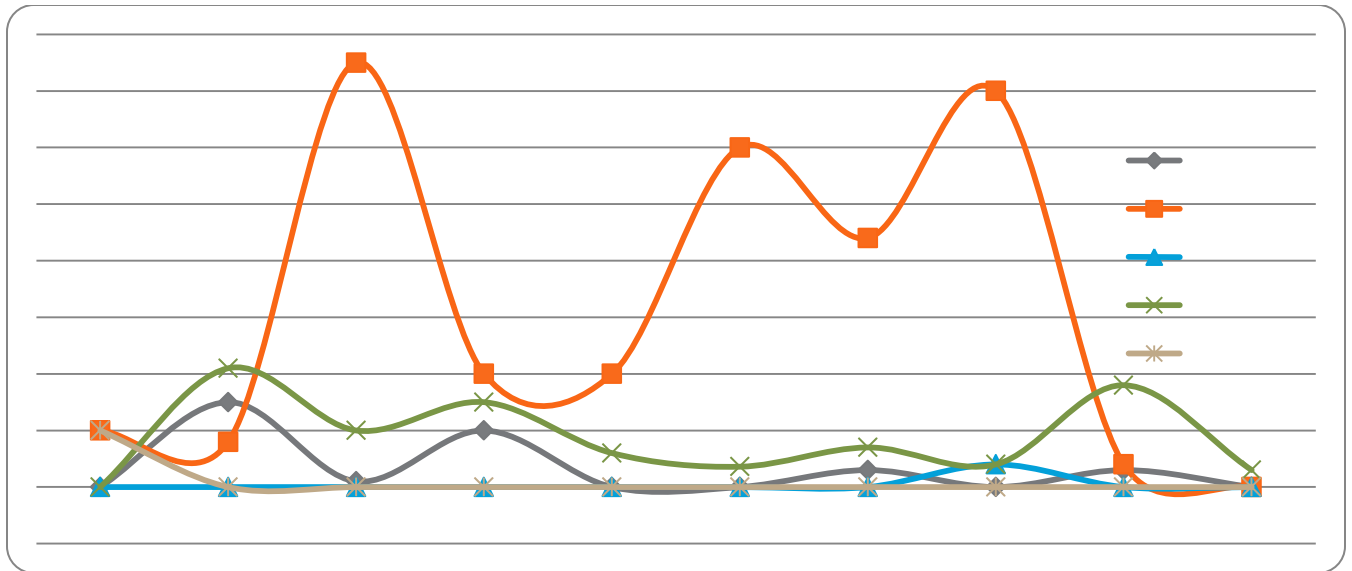


Figure 8: Daily trend for each SUBgroup – Confidential Bank of America Information has been removed

Furthermore, a report showing Trade status, Account Name and whether it is buy vs. sell could be relevant to managers who want to see the volume of the inquiries that are done vs. other trade statuses as well as the side of the trade. An example is seen in the Table 8 below.

Sum of Quantity	B EUR	B Total	S EUR	USD	S Total	Grand Total
Done	960,000,000	960,000,000	1,028,000,000	20,000,000	1,048,000,000	2,008,000,000
Account Name 1			25,000,000		25,000,000	25,000,000
Account Name 2			50,000,000		50,000,000	50,000,000
Account Name 3			100,000,000		100,000,000	100,000,000
Expired	50,000,000	50,000,000				50,000,000
Account Name 4	50,000,000	50,000,000				50,000,000
Passed	65,000,000	65,000,000				65,000,000
Account Name 1	25,000,000	25,000,000				25,000,000
Account Name 5	15,000,000	15,000,000				15,000,000

Account Name 6	25,000,000	25,000,000				25,000,000
TraderRejected	100,000,000	100,000,000				100,000,000
Account Name 1	25,000,000	25,000,000				25,000,000
Account Name 7	75,000,000	75,000,000				75,000,000
Grand Total	1,175,000,000	1,175,000,000	1,028,000,000	20,000,000	1,048,000,000	2,223,000,000

Table 8: The volume of the inquiries that are done vs. other trade statues – Confidential Bank of America Information has been removed

4.3.4 CDS TWQ BMLE (EMEA) - DONE TRADES (PRODUCTION)

This daily report comes in the form of an excel file and seems to be a subset of the CDS TWWQ BMLE (EMEA) – All Transactions (Productions) table. This file however only shows the trades that have a status of done on given day. This file, just like the previous, contains columns that could be eliminated, such as the columns Subordinate, Reconstruction and Series could be eliminated since they seemingly always return a value of ‘NA’ and ‘ITRAXX’ respectively.

Extracted from this table could be data respecting at time of day and trades done with the respective reference companies from the SUBGroup category. This is shown in Table 9 and Figure 9.

Sum of Quantity	B	S	Grand Total
8 AM	102,000,000	4,000,000	106,000,000
Sub Group 1	60,000,000		60,000,000
Sub Group 2	5,000,000		5,000,000
Sub Group 3	25,000,000		25,000,000
Sub Group 4	12,000,000	4,000,000	16,000,000
9 AM	75,000,000		75,000,000
Sub Group 2	50,000,000		50,000,000
Sub Group 4	25,000,000		25,000,000
10 AM	10,000,000	65,000,000	75,000,000
Sub Group 2	10,000,000	50,000,000	60,000,000
Sub Group 4		15,000,000	15,000,000
11 AM	5,000,000	10,000,000	15,000,000
Sub Group 2	5,000,000		5,000,000
Sub Group 4		10,000,000	10,000,000
12 PM		20,000,000	20,000,000
Sub Group 4		20,000,000	20,000,000
1 PM	50,000,000		50,000,000
Sub Group 2	50,000,000		50,000,000
2 PM	45,000,000	50,000,000	95,000,000
Sub Group 1		50,000,000	50,000,000
Sub Group 2	35,000,000		35,000,000
Sub Group 4	10,000,000		10,000,000
Grand Total	287,000,000	149,000,000	436,000,000

Table 9: Trades done with the respective reference companies – Confidential Bank of America Information has been removed

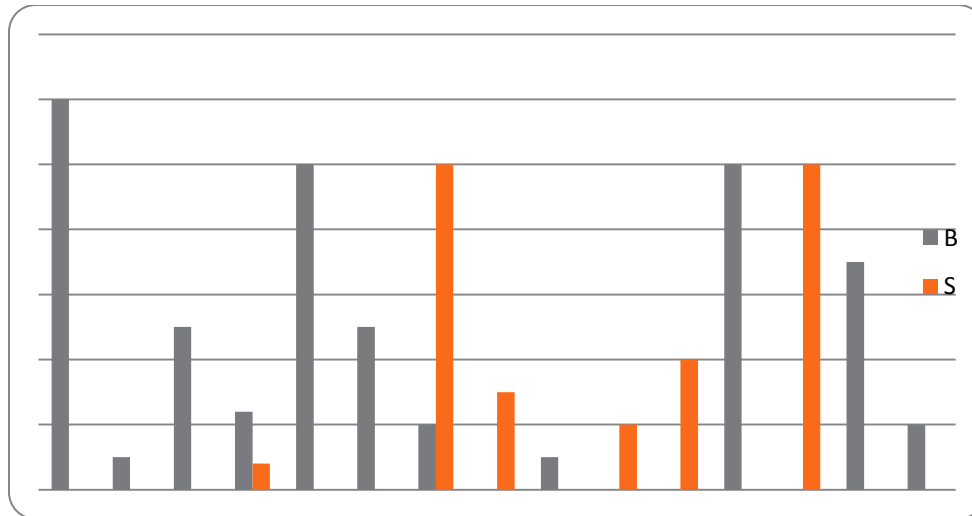


Figure 9: Trades done with the respective reference companies

Additionally, analysis could be done as shown in Table 10 and Figure 10, on time vs. trader to show the performance of a given trader at specific times of the day. Again it would be beneficial if this showed trader name instead of NBK. However, due to proprietary rules by Bank of America we have used “Employee” instead of the actual trader’s name in this report.

Sum of Quantity	Column Labels		
Row Labels	B	S	Grand Total
Employee	252000000	49000000	301000000
8 AM	67000000	4000000	71000000
9 AM	75000000		75000000
10 AM	10000000	15000000	25000000
11 AM	5000000	10000000	15000000
12 PM		20000000	20000000
1 PM	50000000		50000000
2 PM	45000000		45000000
Employee	10000000	100000000	110000000
8 AM	10000000		10000000
10 AM		50000000	50000000
2 PM		50000000	50000000
Employee	25000000		25000000
8 AM	25000000		25000000
Grand Total	287000000	149000000	436000000

Table 10: Time vs. Trader Buy/Sell – Confidential Bank of America Information has been removed

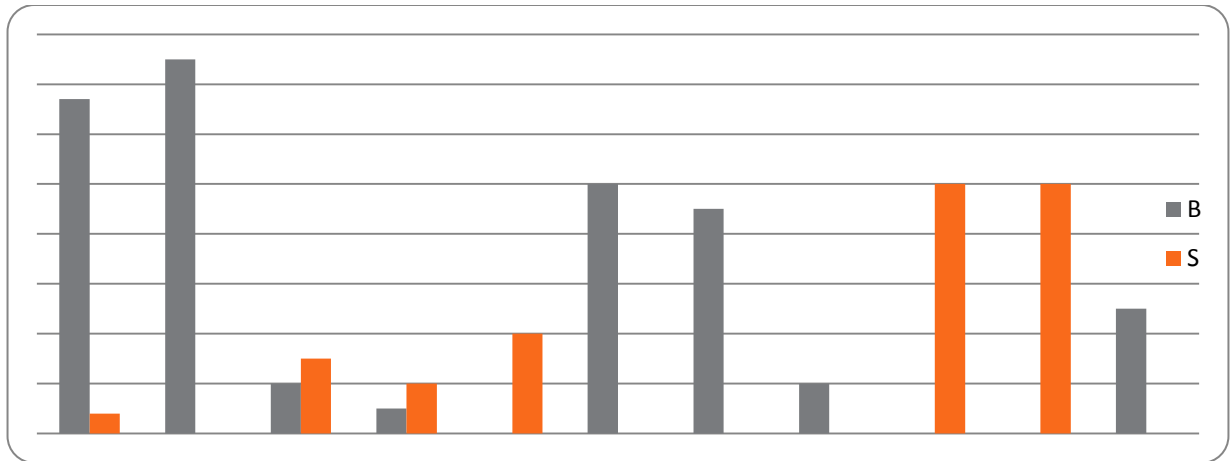


Figure 10: Time vs. Trader Buy/Sell

4.3.5 ITRADER CLIENT ORIGINATED INQUIRIES

The above named report comes in the form of an excel document attached to the email and is generated on a daily basis. This table includes all daily Nominal USD of All Inquiries and the Accepted Inquires including the respective Counts for those values starting from the first trading day of the previous year to the present day. Thus, two years of data is stored in this document. Table 11, Table 12 and Figure 11, Figure 12 are an example of brief tables that aggregate all this data into monthly totals and the corresponding graph. However, to the proprietary nature of the information, specific dates have been removed from Figures 11 and 12.

Column Labels					Total Sum of Ticket COUNT (Accepted Inquiries)	Total Sum of Ticket COUNT (ALL Inquiries)
Row Labels	2010 Sum of Ticket COUNT (Accepted Inquiries)	Sum of Ticket COUNT (ALL Inquiries)	2011 Sum of Ticket COUNT (Accepted Inquiries)	Sum of Ticket COUNT (ALL Inquiries)		
Jan	5,020	31,745	4,417	37,083.00	9,437	68,828
Feb	6,120	33,260	5,594	38,160.00	11,714	71,420
Mar	7,022	38,475	5,299	39,660.00	12,321	78,135
Apr	6,390	39,211	4,095	32,473.00	10,485	71,684
May	6,488	49,697	4,380	33,334.00	10,868	83,031
Jun	8,183	44,418	4,475	37,776.00	12,658	82,194
Jul	7,065	38,600	4,195	40,229.00	11,260	78,829
Aug	6,595	32,624	3,468	53,964.00	10,063	86,588
Sep	7,789	42,127	4,988	59,403.00	12,777	101,530
Oct	6,504	38,349	7,447	64,380.00	13,951	102,729
Nov	5,019	37,482	2,962	25,600.00	7,981	63,082
Dec	4,247	38,702			4,247	38,702
Grand Total	76,442	464,690	51,320	462,062.00	127,762	926,752

Table 11: Monthly Totals (Tickets Count)

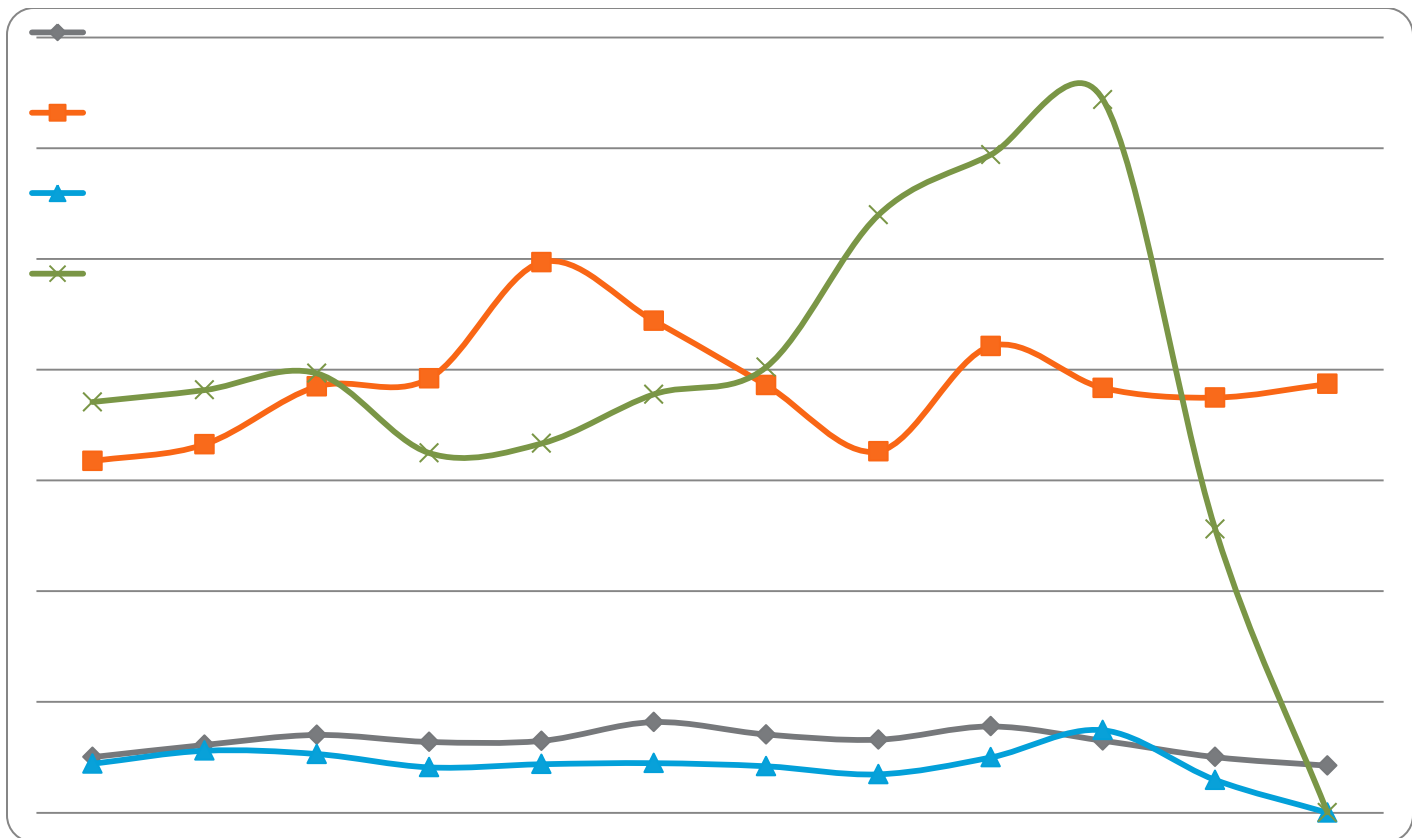


Figure 11: Monthly Totals (Tickets Count) – Confidential Bank of America information has been removed

Column Labels						Total Sum of Nominal USD (Accepted Inquiries)	Total Sum of Nominal USD (ALL Inquiries)
2010		2011					
Row Labels	Sum of Nominal USD (Accepted Inquiries)	Sum of Nominal USD (ALL Inquiries)	Sum of Nominal USD (Accepted Inquiries)	Sum of Nominal USD (ALL Inquiries)			
Jan	\$ 2,634,536,197.00	\$ 21,013,177,056.00	\$ 2,052,708,814.00	\$ 23,128,725,011.00	\$	4,687,245,011.00	\$ 44,141,902,067.00
Feb	\$ 2,639,910,008.00	\$ 20,881,617,812.00	\$ 2,670,087,230.00	\$ 21,920,975,328.00	\$	5,309,997,238.00	\$ 42,802,593,140.00
Mar	\$ 3,383,235,516.00	\$ 22,960,876,137.00	\$ 2,393,239,339.00	\$ 24,016,183,738.00	\$	5,776,474,855.00	\$ 46,977,059,875.00
Apr	\$ 3,172,180,054.00	\$ 30,537,047,291.00	\$ 1,822,644,160.00	\$ 19,475,912,877.00	\$	4,994,824,214.00	\$ 50,012,960,168.00
May	\$ 2,166,796,870.00	\$ 24,839,579,848.00	\$ 2,223,858,466.00	\$ 21,038,918,800.00	\$	4,390,655,336.00	\$ 45,878,498,648.00
Jun	\$ 2,533,984,271.00	\$ 20,799,470,388.00	\$ 2,130,242,535.00	\$ 22,221,089,178.00	\$	4,664,226,806.00	\$ 43,020,559,566.00
Jul	\$ 2,713,251,673.00	\$ 20,705,894,230.00	\$ 1,739,428,609.00	\$ 21,945,723,961.00	\$	4,452,680,282.00	\$ 42,651,618,191.00
Aug	\$ 2,695,109,573.00	\$ 17,370,528,963.00	\$ 1,373,891,358.00	\$ 27,036,562,226.00	\$	4,069,000,931.00	\$ 44,407,091,189.00
Sep	\$ 3,123,748,363.00	\$ 22,952,338,906.00	\$ 1,573,820,623.00	\$ 27,309,779,619.00	\$	4,697,568,986.00	\$ 50,262,118,525.00
Oct	\$ 2,973,196,776.00	\$ 22,494,908,172.00	\$ 2,744,515,710.00	\$ 29,299,775,773.00	\$	5,717,712,486.00	\$ 51,794,683,945.00
Nov	\$ 2,345,069,948.00	\$ 23,051,517,924.00	\$ 1,112,684,870.00	\$ 12,263,365,669.00	\$	3,457,754,818.00	\$ 35,314,883,593.00
Dec	\$ 1,519,803,648.00	\$ 17,650,862,589.00			\$	1,519,803,648.00	\$ 17,650,862,589.00
Grand Total	\$ 31,900,822,897.00	\$ 265,257,819,316.00	\$ 21,837,121,714.00	\$ 249,657,012,180.00	\$	53,737,944,611.00	\$ 514,914,831,496.00

Table 12: Monthly Totals (Volume Nominal USD)

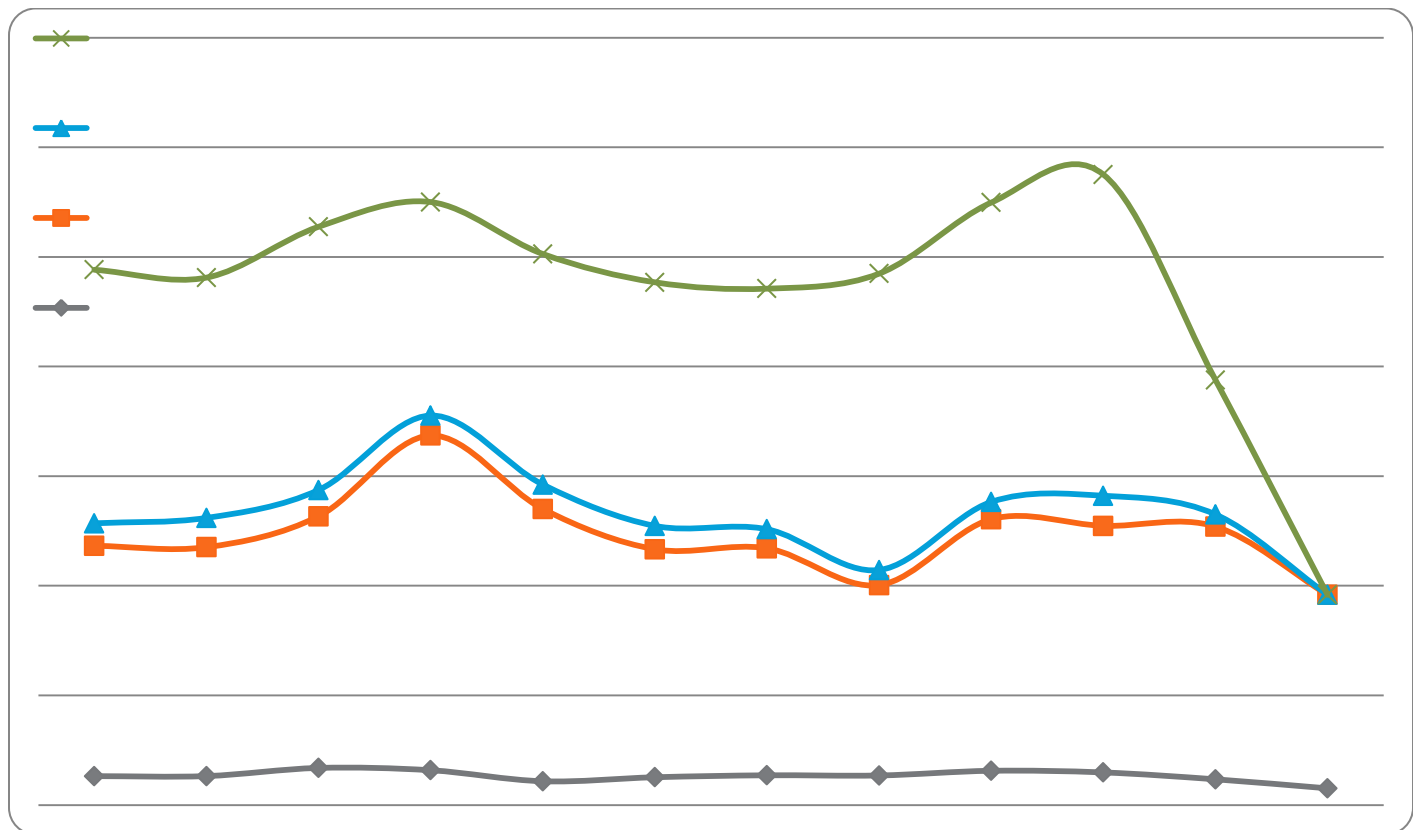


Figure 12: Monthly Totals (Volume Nominal USD) – Confidential Bank of America information has been removed

4.3.6 ECOMMERCE STATISTICS - EMEA FLOW CREDIT PRIORITY CLIENTS

This is a daily report which comes in the form of two tables. The first table would normally highlight the hit rate based on client, thus managers can see on a client-by-client basis how successful they are meeting the inquires/orders, however this confidential information was removed from our report. A snapshot of this is shown below in Table 13.

eCommerce Statistics - EMEA Flow Credit Priority Clients							
Client	Hit Rate	Done	Not Done	Done Away	None	Total USD	Total Count

Table 13: Reviewed Report – Confidential Bank of America information has been removed

The next Table 14 then takes the above table and breaks out the hit rate by trader so both managers and traders can see a trader's respective hit rate depending on a specific client. This is shown below with the confidential information removed. A trader could also use this total of their respective hit rates and find an average for the day. In either instance, one can thus track on a daily, week, and monthly basis to see if there are particular client trends or time sensitive trends.

eCommerce Statistics - EMEA Flow Credit Priority Clients								
Client	Trader	Hit Rate	Done	Not Done	Done Away	None	Total USD	Total Count

Table 14: Reviewed Report – Confidential Bank of America information has been removed

Subsequently, after our analysis of EMEA Reports produced and distributed by ConnectX, we came to the conclusion that not all the reports need to be changed. However, eCommerce Statistics - EMEA Flow Credit Priority Clients is a report that could benefit from some modifications by including the analysis we did in sections 4.1 and 4.2. Along a similar vein, it became apparent after interviewing some junior traders that some of the reports would be more useful if they were separated by pod information instead of by individual trader statistics. This would provide a more holistic picture of how the different sectors of the desk are doing on a daily basis. The responses from our interviews can be found in **Appendix B: Interview Questions for Junior Traders**.

Shown in Table 15 below, was the report we used to implement the changes described above using SQL programming language, so it would be easier for Bank of America to insert the code into ConnectX.

Credit eCommerce Statistics				
14 DEC 2011 18:00:48				
Credit eCommerce Statistics for 14 DEC 2011				
All Platform Flow - Buy/Sell Breakdown (Done and Not Done Trades)				
Trader	Buy Tickets	Buy Nominal USD	Sell Tickets	Sell Nominal USD

Table 15: Reviewed Report – Confidential Bank of America information has been removed

The breakdown by Pods is shown in Table 16, where tickets, broken down by volume (nominal USD) that were accepted, expired, rejected or passed by a client for a particular day are grouped by Corporates, Financials and High Yield instead of individual trader. For example, the proposed table shows total accepted tickets by volume of the Corporate Pod was 14,015,861

nominal USD at the end of the day rather than providing an information for each trader in alphabetized order. The SQL code was written in such way that if it is run at the end of the day it automatically uses data for that exact day. Due to the proprietary nature of the SQL code, this information was removed from the report.

Results		Messages											
	Pod	Summary	Accepted	Expired	Rejected	ClientPassed	Covered	TradedAway	Buy	Sell	BuyCount	SellCount	Total
1	NULL		0	0	0	0	0	0	0	0	0	0	0
2	Corporates		14015861	2830693	13829669	4847778	0	0	0	0	0	0	35524001
3	Financials		7690787	4028177	18429820	7192537	0	0	0	0	0	0	37341321
4	HY		4994855	7892216	138825	2220033	0	0	0	0	0	0	15245930
5		TOTAL	26701503	14751086	32398314	14260348	0	0	0	0	0	0	88111252

Table 16: SQL output for the breakdown by pod

5. CONCLUSIONS

Throughout many weeks of analysis we have come to our first conclusion. It is regarding the reporting tool, ConnectX. ConnectX was a reporting tool/application built by Merrill Lynch that was used to send reports on a timely basis to managers and traders at the Credit and Rates Desk and was then brought on board and used by the credit EMEA desk Bank of America when the acquisition of Merrill Lynch took place. This tool carries out the task that was initially built to do. That being said, full utility is not being gained from the reports and it costs money to maintain. Traders have a busy 11 – 12 hour day, and most do not think it is necessary to open these reports as they feel that no instant added value is garnered from them. Most of the information that the traders could get from these reports required them to do their own further analysis.

This therefore, leads to our second conclusion that, the reporting system can and needs to be improved. The present system using ConnectX does not allow for the production of visuals in the reports, which could provide added value as a supplement to the already given raw data. Furthermore, reports would be more useful if they were separated by Pod, Trader, etc.

If these improvements are made, it stands to reason that these reports can give added insight to the business. They could be used as performance measures, which could lead to a more profitable business. For example, managers can readily see more accurate Hit Rates for priority clients and make adjustments where possible. For traders, they create these markets and are charged with making the business money so if they can use these reports to anticipate what their

individual markets are doing then they can attack trades with more knowledge and potentially become more profitable.

6. RECOMMENDATIONS

At the completion of our project at Bank of America Merrill Lynch we have formed our recommendations based on the above conclusions. The first recommendation is to change the organization of the reports, specifically organize by pod. During our project we had a chance to speak with a few traders and ask them questions regarding the ConnectX reports that they get daily. To the question “What would you change in the reports?” most of them answered that they would like to see a breakdown by pod. A pod, as was mentioned earlier, is a sector of business and there are three pods: Corporates that trade corporate products, Financials that trade financial products and High Yield (HY) that trade high yield products. Since the current reports contain a breakdown by trader, it would be beneficial to see a breakdown by pod as well, since some of the traders are in the same pod and trade the same products.

Our next recommendation is to introduce a graphical tool that can produce visuals. Some of the reports that ConnectX generates come as an Excel attachment and bank employees need to open the attachment and do further analysis on their own to gain any added value. However, introducing graphs and charts that summarizes the information in the attached file would provide an insight to data and be less time-consuming. Some of the interviewed traders also mentioned that they would like to see visuals. The limitation is that ConnectX uses SQL as a programming language and doesn't have an ability to build graphs and charts. There are a few solutions to this: to program ConnectX in Python or Quartz, or graph in Excel that would take a lot of time.

And finally, our last recommendation, if the business is moving towards a centralized database and reporting system, either augment ConnectX to carry out our previous

recommendations and roll it out to the other desk, or leverage what works about ConnectX and implement it into a new system.

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APPENDIX A: LITERATURE REVIEW

Aznie Zainudin, W. R., & Board, J. (2011). Comparisons between transparency in the United States of America (US) corporate bond market and European corporate bond market: criticisms of transparency in us markets from European markets perspective. *Communications of the IBIMA*, 1(5), 42-46.

Communications of the IBIMA (CIBIMA) is an online open access journal that publishes full papers that have been blindly reviewed. The aim of the CIBIMA is to publish quality research papers, view points, and conceptual papers that significantly contribute the body knowledge of the field of information management in terms of theory and practice. This particular article written by *Aznie Zainudin & Board* investigates the differences between the impacts of transparency in the US and European Corporate Bond Markets by studying the criticisms of transparency in the US markets from European markets perspective. The study makes two assumptions namely as the level of understanding on transparency in the European market increase; the spreads decrease and the volume of trading do not decrease. The results of such a study has given us market insight on how bonds might trade given the level transparency of the market.

Heston, S., & Sadka, R. (2010). Seasonality in the cross section of stock returns: the international evidence. *Journal of Financial and Quantitative Analysis*, 45(5), 1133–1160.

The *Journal of Financial and Quantitative Analysis* publishes theoretical and empirical research in financial economics. This paper written by *Heston & Sadka* studies seasonal predictability in the cross section of international stock returns. From their research were able to conclude that stocks that outperform the domestic market in a particular month continue to

outperform the domestic market in that same calendar month for up to 5 years. Such a pattern appeared in Canada, Japan, and 12 European countries. Review studies such as these provides insight into the different kind of trends and what are some of the correlating factors that could impact the decisions of traders and thus the volume of trades that come to the Bank of America “Deck”.

Shahrokhi, M. (2008). E-finance: status, innovations, resources and future challenges.

Managerial Finance, 34(6), 365 - 398.

The journal, *Managerial Finance*, aims to provide an international forum for the publication of high quality research in: finance, financial management, international finance, economics, banking, financial markets, financial institutions, financial strategy, accounting and management information, corporate finance, investments, real estate, insurance and risk management, global finance, financial education and all other issues related to finance.

The paper by *Shakrokhi* was to provide an overview of the status of e-finance and discuss related issues and challenges at the time. It provided data about growth of e-finance in the last decade leading up to 2008 and sought to introduce advances and innovations in e-finance and challenges facing the financial services and IT industries in the economic climate of that time. As the paper brought together dispersed information and data about e-finance under one umbrella, it provides an outsider looking in insight into the advances in e-finance and applications of innovations and new technology to financial services provided.

Understanding the innovations made in e-finance at such a tumultuous time in the world markets could be key in getting into the minds of present day traders and how specific market conditions could lead to distinct actions or reactions today.

Smith, R. (2011). The Dilemma of Bailouts. *The Independent Review*, 16(1), 15-26.

The Independent Review is an interdisciplinary journal devoted to the study of political economy and the critical analysis of government policy. In this article, the author, *Smith*, reviews financial crises in the United States from 1984 to the present from the standpoint of regulators, politicians, economists and average citizens. While this paper is not about banking regulation it is helpful to read works such as Smiths to gain insight on the mind frame of clients as instruments such as credit default swaps were heavily blamed for the economic meltdown of 2008 yet they are still traded today and is the partial focus of this report.

Stulz, R. M. (2010). Credit Default Swaps and the Credit Crisis. *Journal of Economic Perspectives*, 73-92.

The Journal of Economic Perspectives (JEP) is an economic journal published by the American Economic Association and it attempts to fill a gap between the general interest press and most other academic economics journals. In the article the author seeks to find what place, credit default swaps may have had in the credit crisis. It looks at the concern that observers have that credit default swaps trade in the largely unregulated over-the-counter market as bilateral contracts involving counterparty risk and that they facilitate speculation involving negative views of a firm's financial strength. Versus the opposing view held by some observers that have suggested that credit default swaps would not have made the crisis worse had they traded on exchanges. In the end, the writer concludes that credit default swaps did not cause the dramatic events of the credit crisis, that the over-the-counter credit

default swaps market worked well during much of the crisis, and that exchange trading has both advantages and costs compared to over-the-counter trading. This article has helped us to shed some light onto how CDS's are viewed in the financial market in general.

APPENDIX B: INTERVIEW QUESTIONS FOR JUNIOR TRADERS

1. Do you use ConnectX Reports?
 - a. If yes, which ones do you find the most useful?
 - b. If No, why not?
2. What do think could enhance the reports i.e. make them more useful?
3. Do you think graphs showing individual performance embedded into the reports would be useful?
4. Would you rather they come as an e-mail or would you rather have a website or application you can access and have it have your personal data and you can splice the day up yourself?

APPENDIX C: GLOSSARY OF TERMS FOR THE CREDIT & CASH DATABASES USED BY THE EMEA CREDIT DESK

BAML-EMEA Credit Glossary - AQCombined Report		
Field Name	Function	Definition of Outputs
Id	serves as a primary key	Primary Key Created by BAML
PLATFORM	platform where trade originates	BB-Bloomberg, MKA - Axxess, TWB-EUCORP - Trade Web, RTFI-Reuters
PLATFORM_REF	Platform Reference Number	Unique identifier of the inquiry on the platform
TRADE_DATE	Date	Date of Trade
TRADE_TIME	Time	Time of Initiation of trade
TRADER	BAML Employee ID	Identifier for BAML employee who clicks/responds to the ticket
TYPE	Type of ticket/order	Inquiry - This is a bond in competition. Here price and size is shown. If we do have a price or size the client may submit an order; Order - This goes to one trader and it means the client is willing to buy or sell.
QUOTED	Response to order	In case of an order, it tells us whether we sent a level back. Did we acknowledge their request? <i>(If it is an inquiry then this field is not useful)</i>
AUTOQUOTED_AUTOEXECUTED	Under a certain level either automatically put through the trade or automatically sent the price level for an inquiry	Whether automatic action was taken for an inquiry or a trade
LAST_DEALER_ACTION	Status of the inquiry from the dealers perspective	Done - Trade completed; None - Trade was ignored; Rejected - BAML rejected the trade; Quoted

		- BAML sent a level
LAST_CLIENT_ACTION	Status of inquiry from clients perspective	Done - Trade Completed; Sent - Client Sent Level; Expired - Trade was ignored; Passed - Client rejected the trade
ACTION_DETAIL	Encapsulates the four previous columns	Encapsulates the four previous columns
DONEAWAY_DETAIL	In the case where the trade is not done, then this gives the reason.	Cover - we were second best price; None - no information was given; Tied - we had the same price as the winner but for some reason client chose another dealer
DEALERS	Total number of dealers on trade at the time	How many dealers were involved in the trade including BAML
CLIENT_NAME	Name of client	Name of Client
IPS_SYMBOL	Unique identifier of the client	Internal identifier for a client
CLIENT_TIER	Tier that client is assigned	Gold : Best Client; Silver : Good Client; Bronze : Average Client; Aggressive : Worse than an average client
CLIENT_USER	Platform definition of Client	Username of client that raised the inquiry
ML_BUY_SELL	Whether BAML is being asked to buy or sell	Whether BAML is being asked to buy or sell
ISIN	Unique identifier that comes from a correlation 3 attributes	Correlates the data captured by Ticker, Coupon & Maturity into a unique identifier
TICKER	Ticker of Bond	Bond Client makes inquiry about
COUPON	Coupon of Bond	Coupon Price
MATURITY	Maturity of Bond	Date when bond matures
NOMINAL_EURO	Converts the nominal size of the inquiry into Euros	Size of the inquiry in Euros
NOMINAL_USD	Converts the nominal size of the inquiry into USD	Size of the inquiry in USD
NOMINAL	Nominal size of inquiry	Size of the inquiry in the bonds native currency
CURRENCY		Native currency of the bond
PRICE	Gives price of level quoted	Level Quoted
COVER_PRICE	Price of second best offer	Second Best Price
SALES_NAME	Name of sales person	Name of the sales person

ORIGIN	Where is the trade coming from	C - Client coming to us directly; S - Sales person puts in the trade on behalf of client (facilitates the booking of the trade); T - some other trader within the firm
BM Spread		Different way of communicating the price.
DESK		Desk where trade originated. e.g. Credit

BAML-EMEA CDS Glossary – CDS Reports

<u>Field Name</u>	<u>Function</u>	<u>Definition of Outputs</u>
Trade Date	Date	Date of Trade
Trade Time	Time	Time of Initiation of trade
Market	Market Symbol	Name of the Market
Negotiation Id	Unique identifier on the platform that we are trading	
TEA Id	Market_TradeDate_Negotiation Id	Contains Market, Trade and Negotiation Id
CDS Name	Name of CDS, contract	Which contract we are trading defines what contracts reference is
Side	Tells us whether we are being asked to Buy or Sell	
Quantity	Quantity	Quantity of CDS that is being traded
Trade Status	Status of a trade	Done - Trade Completed; Rejected - Trade Rejected; Expired - Trade was ignored; Passed - Client rejected the trade
Executing Trader	BAML Employee ID	Identifier for BAML employee who executes the trade
Portfolio	Tells us if/when trade is done and where the trade is put	Books of trades
Price/Spread	Gives price/spread of CDS, high yield -> price	Different way of communicating the price.
Price Type		Spread
Deal Spread	Every contract a distinct deal Spread (all trades are done on this deal spread, e.g. 100 or 500 basis points)	The difference b/w deal spread and price/spread

Fee	PV of difference between Deal Spread and Price/Spread	
Currency	Currency Symbol	Native currency of the bond
Customer Name	Name of customer	Name of the customer
Account Id	Unique identifier of the client's account	Internal identifier for a client's account
Account Name	Name of client's firm	Name of the client's account
Sales Person	Name of sales person	Name of the sales person
Trade Type	Type of the trade	Order or inquiry, RSM - request from market
BBG Ticker	Ticker of CDS in Bloomberg	
RedCode	Unique identifier for a CDS instrument, the market standard	There is the same Redcode in all markets to identify the specific contract that is being traded
Maturity	Maturity of CDS	Date when CDS matures
Tenor	Term- time in years between a next CDS roll and its maturity (rolls happen every three months)	Length of time b/w the next CDS roll and the maturity
Subordination	Bond that a CDS is referring to (Characteristics of the CDS contracts)	has to do with the bond that CDS is referring to
Restructuring	Defining which sorts of events can trigger a CDS payment	has to do with defining which types of the event can trigger the CDS payments
Series Type	Type of the series	ITRAX
Sub GROUP	Reference companies	Main - Investment grade European companies, XOVER - non-investment grade European companies, Fin Sen - senior debt of European financial companies, Fin Sub - subordinated debt of European financial companies, West Eur - debt of COUNTRIES in Europe
Index Series	serious type	every 6 months a new index is proposed
CDS Type	Type of CDS	INDEX
CDS Owner	Name	Name of the owner of CDS